# ENGINEERING OUTLOOK

## AT THE UNIVERSITY OF ILLINOIS

RESEARCH
EDUCATION
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UNIVERSITY OF ILLINOIS BULLETIN · COLLEGE OF ENGINEERING · ENGINEERING EXPERIMENT STATION

VOL. 1, NO. 8, DECEMBER 1960

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### THE CONSTRUCTION ENGINEERING CURRICULUM

You are a contractor who is interested in bidding on a highway job which requires 100,000 tons of grade 7 gravel. Would you like to be able to obtain this gravel for 50 per cent of what you might be paying now?

You are a contractor who is constructing a building. Would you like to be able to know (1) on what date you should order each of your materials; (2) what dates you should insist upon for their deliveries; (3) the starting and finishing dates of each of the critical jobs in the construction sequence; and (4) how much leeway exists in each of the noncritical jobs — so you could construct the building for 75 per cent of what it might cost you now?

You are a contractor who is interested in bidding on some earthwork. Would you like to be able to determine (1) how long each piece of your available equipment should be used on which operations; (2) which pieces of equipment you should rent; and (3) how long each piece of rented equipment should be used on which operations — so you could do the job at minimum cost to you?

If your answer to any of these questions is "yes," you should be interested in a unique educational program at the University of Illinois which is headed by Professor L. R. Shaffer and administered by the Construction Engineering Division of the Civil Engineering Department. These questions are typical of the sort that are asked in this program, which is dedicated to scientific studies of scheduling, planning, and the selection of men, materials, and equipment that will allow the contractor to perform his work with maximum efficiency and profit.

A student who majors in construction engineering will take all the regularly required courses in civil engineering plus five courses in his major field. These courses are Construction and Engineering Economy, Construction Productivity, Construction Planning, Construction Cost Estimates and Analyses, and Engineering Law. They are designed to teach the student how to apply fundamental principles of economics, mathematics, and the physical sciences to the evaluation of the factors which underlie all construction work. A certain amount of stress is placed on the limitations of such applications. These principles cannot be used as a substitute for the contractor's good judgment and the knowledge he has gained from experience. They certainly can, however, provide numerical results which will aid him in making decisions.

Education and research work such as that being done by the U. of I. Construction Engineering Program will some day eliminate much of the guesswork which now plagues the contractor on the more complex construction sequences — as well as furnish graduates who will have practical experience and background in solving such problems. This program will provide the sort of knowledge that has been sorely needed by construction contractors since Marcus Appius lost his toga in CDXIX B.C. contracting on the first road that led to Rome.

### SANITARY ENGINEERING CONFERENCE

When Leeuwenhoek reported seeing "wee beasties" through his new microscope in 1683, he didn't know what he was helping to start. From nearly three centuries away, you might say he deserves some credit for the Third Sanitary Engineering Conference at the University of Illinois. The Conference title, "Disinfection and Chemical Oxidation in Water and Waste Treatment," indicates that Leeuwenhoek's wee beasties, and perhaps some he didn't see, will be important topics.

The Conference will be held January 31-February 1, 1961, on the University of Illinois campus in Urbana. It will be sponsored jointly by the Division of Sanitary Engineering of the Illinois Department of Public Health, and the Department of Civil Engineering of the University.

A distinguished group of nineteen speakers has been arranged for the two-day meeting, including men from industry, federal and state agencies, and the faculty of the University. Some of these speakers are E. J. Laubusch, Technical Manager for the Chlorine Institute in New York City; R. S. Ingols, Director of the School of Applied Biology, Georgia Institute of Technology; and R. J. Brink, Director of Industrial Waste Control, Buick Motor Division in Flint, Michigan. The featured speaker of the two-day program will be W. J. Orchard, Director-Consultant for the Wallace and Tiernan Company of Newark, New Jersey. He will speak at the dinner on Tuesday, January 31.

The registration fee for the Conference is $15. This fee does not include meals and lodging. Housing information for the Conference is provided with the program on inquiry.

Copies of the complete program and further information concerning registration, housing, and other details can be obtained from Professor Ben B. Ewing, Department of Civil Engineering, University of Illinois, Urbana, or from C. W. Klassen, Chief Sanitary Engineer, Department of Public Health, Springfield, Illinois.

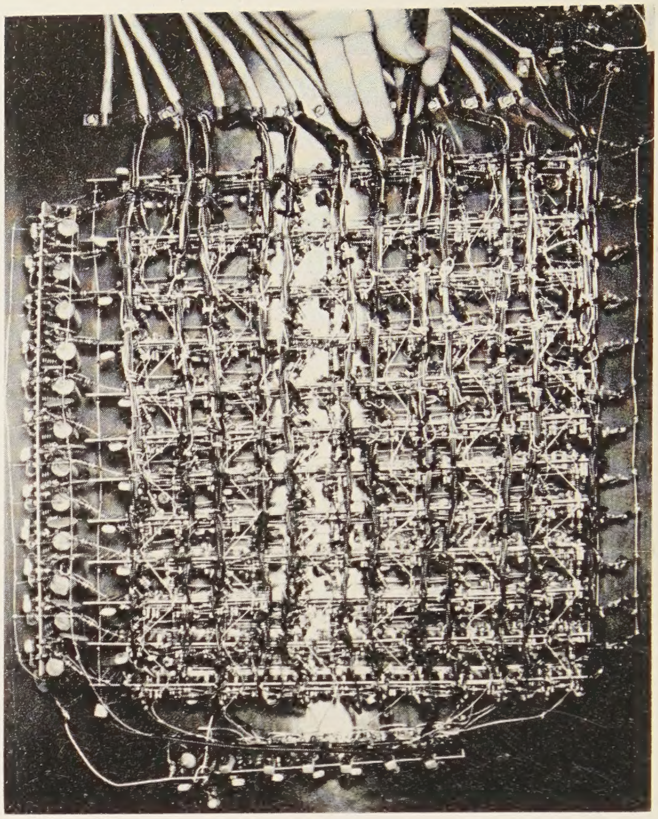
### BIOLOGICAL COMPUTERS

Most visitors to the University of Illinois Biological Computer Laboratory are probably surprised not to find a big box labeled *Biological Computer.* Instead they are told that such computers do not come in boxes yet, but that examples can be found almost everywhere, crawling, walking, or jumping around on two, four, six, or more legs: they are the living creatures which respond in a well-ordered manner to the stimuli of an environment which itself has order and structure.

An uninitiated visitor, protesting that cockroaches have never been caught compiling logarithmic tables, will soon be told that, nevertheless, they must apply some computational principles in order to survive. He may remember that attempts to step on one of these creatures usually ends in failure; the roach escapes because it has figured out the man's pattern of movement in time to move out of the way.

Today many fascinating computational principles which are the basis for the complex activities of living animals are known. These principles should not be confused with the computational principles used in modern digital or analog computers — the ones which *are* in big boxes. Living systems have to respond quickly and reliably to complex stimuli in spite of the fact that their ultimate information handling component — the nerve cell — is slow and unreliable. Existent electronic computers, on the other hand, perform relatively simple operations — additions, multiplications, etc. — with extremely fast and ultra-reliable electronic components. This handicap of the living creature is, however, more than compensated by the versatility of its information processing networks.

The people in the Biological Computer Laboratory, under Professor Heinz von Foerster, are interested in analyzing and synthesizing the structure of such networks through electronic "hardware" — not in an attempt to imitate the biological systems, but in order to build electronic devices which exhibit the adaptiveness and self-organization of a living animal.



The computational circuitry of the Numa-Rete, a biological computer property filter which performs a function similar to that of the eye of a living organism.

Just as living organisms adapt themselves to their environments, biological computers can be made to do the same thing in much the same manner. Thus the living organism, through its sense organs and nervous system, selects ordered events from the chaotic mass of information in its surroundings, and the biological computer, depending upon its design, can have sensor units and computational networks which are sensitive only to certain intensities of light, certain frequencies of sound, certain pressures, etc. Devices which perform such selective functions are called "property filters."

One such property filter which has been constructed at the University is called the "Numa-Rete." It is an array of photocells which are connected to an appropriate network so that it "sees" at one glimpse the number of disconnected objects in the visual field of its retina. This experimental property filter will instantly recognize "7-ness" from "15-ness" as a man can instantly distinguish between "green-ness" and "red-ness."

A visitor to the laboratory will also find other networks in operation. There is one which "learns" the rules of simple games without being told what these rules consist of. He will discover a variety of complex components, so-called "artificial neurons," which are able to learn, to forget, and spontaneously become active when threatened with isolation. He will see networks under construction which can attempt self-repair and others which can recognize the size and shape of geometrical objects.

He will come to realize that some of the artificial networks in the Biological Computer Lab exhibit the same sort of curiosity about their surroundings that he is showing toward them. We predict that by the time he leaves he will certainly appreciate the fascinating aspects of this novel area which lies between biology, electronics, physiology, and psychology.

### BEING COMPETITIVE THROUGH PLANNING

Winter is a good time to stir up interest in home heating, but for hydronic heating contractors it is a "hot" subject any time. In this highly competitive field, the contractor who keeps up with the latest information can best serve his customers and conduct a successful business. To help bring this information to contractors, the University of Illinois and the Institute of Boiler and Radiator Manufacturers are jointly sponsoring their Thirteenth Short Course on Hydronic Heating and Cooling Systems.

The name of this year's short course is "Fundamentals of Being Competitive Through Managerial and Technical Planning," a course designed for hydronic heating contractors, specifically owners and managers. The course will be held January 30-February 2, 1961, on the Urbana campus. It is a supplement to the I=B=R Hydronic Heating School and is not a substitute for it. Meeting today's competition requires careful planning and both this course and the I=B=R School are designed to assist heating contractors to attain that objective.

Technical sessions in the four-day program will cover such topics as heating and load calculations, bidding, and selection of equipment. They will include a tour of research facilities at the University. Sessions on management will consider business policies and growth, organization, estimating practices in relation to direct and overhead costs, advertising and promotion, and research for improved future technology.

The registration fee for the Short Course is $40 per person. This fee includes text materials but not food and lodging. Additional information, preliminary programs, and registration and housing forms are available on request from the Supervisor of Engineering Extension, 116D Illini Hall, Champaign, Illinois.

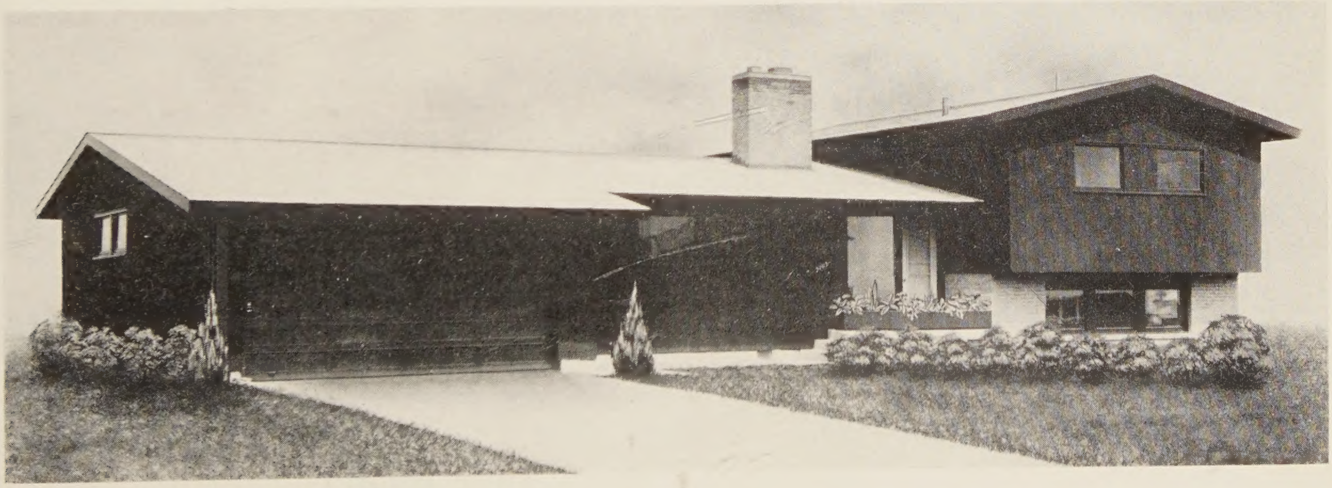
### HYDRONIC HEATING AND COOLING RESEARCH SUMMARY

Twenty years of research in hydronic heating and cooling have been very briefly summarized in a new publication by the Mechanical Engineering Department, "Summary Cooperative Research on Hydronic Heating and Cooling."

The cooperative research program in steam and water heating and summer cooling has been carried on at the University of Illinois since 1940. The work is under a contract between the Engineering Experiment Station and the Institute of Boiler and Radiator Manufacturers. It is now under the direction of Professor Warren Harris of the Department of Mechanical Engineering.

The summary outlines investigations undertaken and the results obtained, with a list of publications containing detailed reports of these results. The material is divided into sections on winter heating, summer air conditioning, heating and air conditioning loads, domestic hot water, and snow melting. In outline form and written for technical people actually in the field, this new publication, Research Series I=B=R-4, is available in limited quantities upon request to the Mechanical Engineering Department, University of Illinois, Urbana, Illinois.

One of the I=B=R Research Homes at the University of Illinois used to study steam and hot-water heating equipment. This is one of the facilities the attendees of the Thirteenth Short Course on Hydronic Heating and Cooling Systems will be shown.



## CHANGES OF ADDRESS

Sometimes success creates almost as many problems as it solves. This has been the case with *Engineering Outlook*. With circulation presently running over 12,000 copies per issue and increasing constantly, keeping addresses up to date has become difficult. One solution to this problem would be for subscribers who are specifying a change of address to also send the printed address from a back issue or an exact copy of it. This would be a great help.

Subscribers to *Engineering Outlook* include private individuals, secondary schools, and major industries throughout the State of Illinois. It is also sent on a reciprocal basis to other universities, both in the U.S. and throughout the world. Designed to keep industry and the public informed about research being done at the University, new scientific techniques, and the latest facts about engineering education, it is also the Engineering College's sole vehicle for the public announcement of new publications and reports.

Any remarks, questions, or suggestions can be addressed to: Engineering Outlook Editors, 114 Civil Engineering Hall, University of Illinois, Urbana. Such comments are appreciated because of our continual desire to improve the paper and make it something more than just another piece of mail for your desk. We realize that there is already enough of this sort!

## STUDENT ENGINEERING MAGAZINE HONORED

Two first place trophies were awarded to the U. of I. student engineering publication, *Illinois Technograph*, this fall at the national convention of the Engineering College Magazines Associated.

The *Technograph* received the awards for best covers for the entire year and best single cover. Barbara Polan, a senior in art, designed the prize-winning covers. Honorable mention went to a nontechnical article, "Wanted: Engineers Who Can Write," by Verne Moberg, a part-time technical editor and senior last year in LAS.

The *Technograph*, published since 1885, is written, edited, and managed solely by students. *Technograph* staff members gain valuable experience working together to meet deadlines and to build the magazine's circulation. Copies are sent not only to college students but also to about 700 Illinois high schools to stimulate interest in the field of engineering.

The articles, ranging from technical papers to student essays, are all aimed at the engineer and engineering student. The chief purpose of the magazine is to inform the college student of recent technical developments both at the University and in industry. However, many industries also subscribe to the publication in order to keep in touch with the trends in engineering education and research at the University.

Subscriptions are available at $1.50 per year by writing to *Technograph*, 215 Civil Engineering Hall, Urbana, Illinois.

## Recent Publications of the Engineering Experiment Station

*A Summary of Engineering Research 1959*, 146 pp., free of charge.

*Summary Cooperative Research on Hydronic Heating and Cooling*, 30 pp., free of charge.

Bulletin 457, *The Functions and Design of Motor Vehicle License Plates*, by John Baerwald, Delbert Karmeier, and Gordon Herrington, 61 pp., $1.25 per copy.

Circular 67, *Manual of Current Practice for Design, Construction, and Maintenance of Soil-Aggregate Roads*, by Eugene Y. Huang, 145 pp., $1.00 per copy.

**UNIVERSITY OF ILLINOIS BULLETIN**

**Volume 58, Number 33; December, 1960.** Published seven times each month by the University of Illinois. Entered as second-class matter December 11, 1912, at the post office at Urbana, Illinois, under the Act of August 24, 1912. Office of Publication, 49 Administration Building (West), Urbana, Illinois.

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